

IN THE CLAIMS:

The text of all pending claims, (including withdrawn claims) is set forth below. Cancelled and not entered claims are indicated with claim number and status only. The claims as listed below show added text with underlining and deleted text with ~~striketrough~~. The status of each claim is indicated with one of (original), (currently amended), (cancelled), (withdrawn), (new), (previously presented), or (not entered).

Please CANCEL claims 3, 8, 13, 17 and 19 without prejudice or disclaimer and AMEND the claims in accordance with the following:

1. (currently amended) A method for controlling a DC-DC converter, wherein the DC-DC converter includes a first capacitor, a second capacitor, a diode connected in series with the first capacitor, and a main switching transistor having a source, a gate, and a drain, the method comprising:

connecting the diode and the first capacitor that are connected in series with each other between the source and the drain of the main switching transistor;

activating and inactivating the main switching transistor;

generating gate voltage to drive the main switching transistor by connecting the second capacitor ~~between a first node between the~~ in parallel to the first capacitor ~~and the diode and a second node between the first capacitor and one of the source and the drain of the main switching transistor~~ or by disconnecting the second capacitor from the first capacitor in synchronism with the activation and inactivation of the main switching transistor; and

switching the main switching transistor with the gate voltage;

monitoring the voltage of the second capacitor; and

controlling the connection and disconnection of the first capacitor and the second capacitor in accordance with the monitored voltage of the second capacitor.

2. (original) The method according to claim 1, wherein the DC-DC converter further includes a driver circuit for driving the main switching transistor, the method further comprising:

disconnecting the first capacitor and the second capacitor when the main switching transistor is inactivated to charge the first capacitor via the diode with input voltage supplied to the main switching transistor;

connecting the first capacitor and the second capacitor in parallel to each other when the

main switching transistor is activated to charge the second capacitor with the first capacitor; and
supplying the voltage of the charged second capacitor to the driver circuit as drive
voltage of the driver circuit.

3. (cancelled)

4. (original) The method according to claim 1, wherein the DC-DC converter
includes a synchronous rectification transistor connected in series to the main switching
transistor, the method further comprising:

inactivating the synchronous rectification transistor when the main switching transistor is
activated, and activating the synchronous rectification transistor when the main switching
transistor is inactivated.

5. (original) The method according to claim 1, wherein:
each of the first and second capacitors includes a first terminal and a second terminal;
the first terminal of the first capacitor is connected to the diode, the second terminal of
the first capacitor is connected to the second terminal of the second capacitor; and
said generating gate voltage includes connecting and disconnecting the first terminal of
the first capacitor and the first terminal of the second capacitor.

6. (currently amended) A DC-DC converter comprising:
a main switching transistor having a source, a gate, and a drain; and
a gate voltage generation circuit connected to the main switching transistor to generate
gate voltage for driving the main switching transistor, the gate voltage generation circuit
including:

a series-connected circuit configured by a diode and a first capacitor connected
between the source and the drain of the main switching transistor;

a switch circuit connected to the first capacitor; and

a second capacitor connected ~~between a first node between~~ in parallel to the first
capacitor ~~and the diode and a second node between the first capacitor and one of the~~
~~source and the drain of the main switching transistor~~ via the switch circuit, wherein the
gate voltage generation circuit generates the gate voltage by connecting or disconnecting
the first and second capacitors ~~between the first and second nodes~~ in synchronism with
activation and inactivation of the main switching transistor;

a voltage monitoring circuit connected to the second capacitor for monitoring the voltage of the second capacitor to generate a monitoring signal; and

a switch control circuit connected to the voltage monitoring circuit and the switch circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

7. (original) The DC-DC converter according to claim 6, further comprising:
a drive circuit connected to the main switching transistor, the second capacitor, and the switch circuit to drive the main switching transistor, wherein:

the first capacitor is charged via the diode with input voltage supplied to the main switching transistor when the main switching transistor is inactivated; and

the second capacitor connected in parallel to the first capacitor by the switch circuit is charged by the first capacitor when the main switching transistor is activated to generate charged voltage that is supplied to the drive circuit as drive voltage.

8. (cancelled)

9. (original) The DC-DC converter according to claim 7, further comprising:
a synchronous rectification transistor connected in series to the main switching transistor and switched with the main switching transistor in a complementary manner.

10. (currently amended) A DC-DC converter for converting an input voltage to a desired voltage, the DC-DC converter comprising:

a main switching transistor having a source, a gate, and a drain;

a first capacitor and a second capacitor connected between the source and the drain of the main switching transistor to divide the input voltage;

a switch circuit connected to the first capacitor;

~~a diode connected in series with the first capacitor, wherein the second capacitor is selectively connected between a first node between the first capacitor and the diode and a second node between the first capacitor and one of the source and the drain of the main switching transistor; and~~

a drive voltage generation circuit for generating drive voltage for the main switching transistor with the input voltage divided by the first capacitor and the second capacitor;

a voltage monitoring circuit connected to the second capacitor for monitoring the voltage

of the second capacitor to generate a monitoring signal; and
a switching control circuit connected to the voltage monitoring circuit and the switch
circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

11. (currently amended) A DC-DC converter for converting an input voltage to a desired voltage, the DC-DC converter comprising:

a main switching transistor having a source, a gate, and a drain;

a first capacitor connected between the source and the drain of the main switching transistor to generate first charged voltage with the input voltage;

~~a diode connected in series with~~with a switch circuit connected to the first capacitor;

~~a second capacitor selectively connected between a first node between the first capacitor and the diode and a second node between to~~the first capacitor and one of the source and the drain of the main switching transistor and charged by the first charged voltage to generate second charged voltage; and

a drive voltage generation circuit for generating drive voltage for the main switching transistor with the second charged voltage;

a voltage monitoring circuit for monitoring the second charged voltage to generate a monitoring signal; and

a switch control circuit connected to the voltage monitoring circuit and the switch circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

12. (currently amended) The DC-DC converter according to claim 11, wherein the ~~drive voltage generation circuit includes:~~

~~a~~the switch circuit is connected between the first capacitor and the second capacitor, the switch circuit selectively connecting the second capacitor to the first capacitor in synchronism with activation and inactivation of the main switching transistor.

13. (cancelled)

14. (original) The DC-DC converter according to claim 11, further comprising:

a synchronous rectification transistor connected in series to the main switching transistor and switched with the main switching transistor in a complementary manner.

15. (currently amended) A semiconductor device for a DC-DC converter, wherein the

DC-DC converter includes:

- a main switching transistor having a source, a gate, and a drain;
- a series-connected circuit configured by a diode and a first capacitor connected between the source and the drain of the main switching circuit; and
- a second capacitor connected to the first capacitor, the semiconductor device comprising:

- a switch circuit connected between the first capacitor and the second capacitor, the switch circuit connecting or disconnecting the first and second capacitors ~~between a first node between the first capacitor and the diode and a second node between the first capacitor and one of the source and the drain of the main switching transistor~~ in synchronism with activation and inactivation of the main switching transistor to generate gate voltage for the main switching transistor; and

- a drive signal generation circuit connected to the switch circuit to generate a drive signal of the main switching transistor;

- a drive circuit connected to the main switching transistor, the second capacitor, and the switch circuit to drive the main switching transistor, wherein the drive circuit receives the gate voltage from the second capacitor as drive voltage of the drive circuit;

- a voltage monitoring circuit connected to the second capacitor to monitor the voltage of the second capacitor and generate a monitoring signal; and

- a switch control circuit connected to the voltage monitoring circuit and the switch circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

16. (original) The semiconductor device according to claim 15, wherein the drive signal generation circuit includes:

- a voltage dividing resistor for dividing output voltage of the DC-DC converter to generate divisional voltage;

- an error amplifier connected to the voltage dividing resistor to amplify the difference between the divisional voltage and a reference voltage to generate an error amplification signal;

- a triangular wave oscillator for generating a triangular wave signal; and

- a PWM comparator connected to the error amplifier and the triangular wave oscillator to compare the triangular wave signal with the error amplification signal and generate a PWM signal as the drive signal.

17. (cancelled)

18. (currently amended) A semiconductor device for a DC-DC converter, wherein the DC-DC converter includes:

a series-connected circuit configured by a diode and a first capacitor; and
a second capacitor connected to the first capacitor, the semiconductor device

comprising:

a main switching transistor connected to the first capacitor and the second capacitor and having a source, a gate, and a drain, wherein the series-connected circuit is connected between the source and the drain of the main switching transistor; and

a switch circuit connected between the first capacitor and the second capacitor, the switch circuit connecting or disconnecting the first and second capacitors ~~between a first node between the first capacitor and the diode and a second node between the first capacitor and one of the source and the drain of the main switching transistor~~ in synchronism with activation and inactivation of the main switching transistor to generate gate voltage for the main switching transistor;

a drive circuit connected to the main switching transistor, the second capacitor, and the switch circuit to drive the main switching transistor, wherein the drive circuit receives the gate voltage from the second capacitor as drive voltage of the drive circuit;

a voltage monitoring circuit connected to the second capacitor to monitor the voltage of the second capacitor and generate a monitoring signal; and

a switch control circuit connected to the voltage monitoring circuit and the switch circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

19. (cancelled)

20. (original) The DC-DC converter according to claim 18, further comprising:

a synchronous rectification transistor connected in series to the main switching transistor and switched with the main switching transistor in a complementary manner.

21. (currently amended) An electronic device comprising:

a DC-DC converter including:

a main switching transistor having a source, a gate, and a drain; and
a gate voltage generation circuit connected to the main switching transistor to

generate gate voltage for driving the main switching transistor, the gate voltage generation circuit including:

- a series-connected circuit configured by a diode and a first capacitor connected between the source and the drain of the main switching transistor;
- a switch circuit connected to the first capacitor; ~~and~~
- a second capacitor selectively ~~connected between a first node between the first capacitor and the diode and a second node between~~ in parallel to the first capacitor ~~and one of the source and the drain of the main switching transistor via the switch circuit, wherein the gate voltage generation circuit generates the gate voltage by connecting or disconnecting the second capacitor between the first and second nodes in synchronism with activation and inactivation of the main switching transistor~~
- a voltage monitoring circuit connected to the second capacitor for monitoring the voltage of the second capacitor to generate a monitoring signal;
- and
- a switch control circuit connected to the voltage monitoring circuit and the switch circuit to activate and inactivate the switch circuit in accordance with the monitoring signal.

22. (original) The electronic device according to claim 21, wherein the DC-DC converter further includes:

- a synchronous rectification transistor connected in series to the main switching transistor and switched with the main switching transistor in a complementary manner.